TEA BREWING SYSTEM

BACKGROUND OF THE INVENTION

Field of the Invention

[1] The present invention relates generally to a beverage preparation system, and more particularly to a tea brewing system.

Background of the Invention

[2] Ready-to-drink tea containing products have become increasingly popular. Many tea containing beverage preparation systems use tea extracts or tea powder to produce tea flavored beverages rather than brewing with actual tea leaves in tea bags. Also, existing tea beverage systems are not fully automated and expose the tea to air throughout the preparation process resulting in inconsistently flavored tea beverages.

[3] Therefore, what is needed is an automated tea brewing system that utilizes actual tea leaves in tea bags for brewing tea-flavored beverages without exposing the tea to air.

[4] The present invention proposes to overcome the above limitations with an automated tea brewing system utilizing actual tea in tea bags.

SUMMARY OF THE INVENTION

[5] The tea brewing system comprises a blending system, brewing system, bag squeezing system and a cooling system. The blending system comprises a system for heating and blending water, sweetener and other flavorings in appropriate proportions. The brewing system comprises brewing and filtering mechanisms coupled with the blending system to brew liquid tea concentrate. The bag squeezing system provides apparatus and method for introducing tea bags into a brew tank and for squeezing tea from the bags and into water for producing liquid tea concentrate. After the tea concentrate has been blended and brewed, a cooling system is utilized to reduce the temperature of the liquid tea concentrate and to preserve the concentrate until the tea concentrate is mixed with water and bottled.

BRIEF DESCRIPTION OF THE DRAWINGS

[6] While the specification concludes with claims specifically pointing out and distinctly claiming the subject matter of the invention, it is believed the invention will be better understood from the following description taken in conjunction with the accompanying drawings wherein like reference characters designate the same or similar elements and wherein:

[7] Fig. 1 is a schematic view of the tea brewing system of the present invention;

[8] Fig. 2 is a cross-sectional side view of the tea bag squeezing system in a tea bag loading position;

[9] Fig. 3 is a cross-sectional side view of the tea bag squeezing system in a brewing position;

[10] Fig. 4 is a cross-sectional side view of the tea bag squeezing system in a tea bag squeezing position; and

[11] Fig. 5 is a view along line 5-5 of Fig. 4.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[12] It is to be understood that the figures and descriptions of the present invention have been simplified to illustrate elements that are relevant for a clear understanding of the invention, while eliminating, for purposes of clarity, other elements that may be well known. Those of ordinary skill in the art will recognize that other elements are desirable and/or required in order to implement the present invention. However, because such elements are well known in the art, and because they do not facilitate a better understanding of the present invention, a discussion of such elements is not provided herein. The detailed description will be provided hereinbelow with reference to the attached drawings.

[13] Referring to Figure 1, the tea brewing system **10** comprises a blend tank **12** which may be a 3,000 gallon tank. A water source **14**, which may be a purified water source wherein the water has been purified by filtering and reverse osmosis, is connected by conduit **16** to blend pump **18**, which may be a seven (7) horsepower centrifugal pump, for pumping water from blend tank **12**. Blend pump **18** is connected by conduit **20** to mass flow meter **22**, which may be a Micromotion mass flow meter, for measuring the fluid passing therethrough.

[14] Mass flow meter **22** is connected by conduit **24** to blend tank **12**. Conduit **24** is arranged in heat transfer relationship with first heat exchanger **26** for heating the fluid passing through conduit **24**. First heat exchanger **26** may be a steam heat exchanger. A steam source **28**, which may be a conventional boiler that produces steam at about 216°F, is connected by conduit **30** to first heat exchanger **26** for providing heat to first heat exchanger **26**.

[15] As can be seen in Figure 1, water from water source **14** is conducted through blend pump **18**, through mass flow meter **22** and through first heat exchanger **26** into blend tank **12**. On the initial filling of blend tank **12**, blend pump **18** may be used to pump water through mass flow meter **22** depending on whether water source **14** is sufficiently pressurized. If water source **14** has sufficient pressure, blend pump **18** may be by-passed on the initial fill of blend tank **12**. Typically, about 2,100 gallons of water at ambient temperature are introduced into blend tank **12** at the beginning of the process. When the required amount of water, as measured by mass flow meter **22**, has been pumped into blend tank **12**, a valve, such as valve **32**, is activated to discontinue the flow of water from water source **14**. The water may then be pumped from blend tank **12** by blend pump **18** through conduit **34**, through first heat exchanger **26** and back to blend tank **12** thereby heating the water to approximately 198°F. Thus, the water is circulated through first heat exchanger **26** until the water reaches the desired temperature.

[16] A first control panel **40** and a second control panel **42**, which may be SIG Simonazzi control panels, are

electrically connected to the various components of the system to operate the components as described herein.

[17] Once the water in blend tank **12** reaches its desired temperature, the brew cycle begins. During the brew cycle, heated water from blend tank **12** is pumped by blend pump **18** out of blend tank **12** through conduit **24** and into conduit **44** by activating and deactivating various valves in the system under control of first control panel **40**. The water then flows through conduit **44** and into brew tank **48** until the desired amount of heated water, such as 600 gallons, is introduced into brew tank **48** and reaches a predetermined height in brew tank **48**.

[18] Referring now to Figure 2, brew tank **48** may include a tea bag squeezing system **50** disposed in and above brew tank **48**. Tea bag squeezing system **50** may comprise a lifting base **52** disposed in brew tank **48** and connected to brew tank lid **54** by a plurality of vertically arranged metal support rods **56**. A plurality of tea bags **58**, which may typically be 44 twenty (20) pound bags of China black or other tea, may be disposed on lifting base **52**. When brew tank lid is attached to brew tank **48**, outside air is prevented from contacting water in the system. A cover gas of nitrogen may be used to prevent oxygen from contacting the water.

[19] Brew tank lid **54** may be attached to an externally mounted hoist **60**, such as a five (5) ton hoist, and supported over brew tank **48** by supporting structure **62**. Hoist **60** is arranged to move lifting base **52** to various selected elevations in brew tank **48**.

[20] A squeeze plate **64** is detachably connected to brew tank lid **54** by stainless steel pins **66**. Supports rods **56** extend through openings in squeeze plate **64** so that brew tank lid **54** and support rods **56** may move vertically relative to squeeze plate **64** as shown in Figure 4. A tea bag hold plate **68**, preferably in the form of an octagonal grid, is spaced vertically beneath the squeeze plate **64** and is connected to squeeze plate **64** by vertical rods **70** so that hold plate **68** is vertically moveable with squeeze plate **64**. Squeeze plate **64** and hold plate **68** move with brew tank lid **54** when pins **66** are in place as shown in Figure 2.

[21] As shown in Figure 4, when pins **66** are removed, squeeze plate **64** and brew tank lid **54** are not attached so that when hoist **60** raises brew tank lid **54**, squeeze plate **64** rests on brew tank **48**.

[22] Referring now to Figure 2, in order to load tea bags **58** onto lifting base **52**, hoist **60** raises brew tank lid **54**. With pins **66** connecting brew tank lid **54** to squeeze plate **64**, raising brew tank lid **54** causes squeeze plate **64** to rise. Since lifting base **52** is connected to squeeze plate **64** by support rods **56**, raising squeeze plate **64** causes lifting base **52** to rise allowing an operator to load tea bags **58** onto lifting base **52**. Generally, tea bags **58** are loaded on lifting base **52** before water is introduced into brew tank **48**. Hoist **60** may then lower brew tank lid **54** so that it rests on and seals brew tank **48** as shown in Figure 3.

[23] After tea bags **58** are loaded onto lifting base **52** and lowered into brew tank **48**, as shown in Figure 3, water is then conducted from conduit **44** into brew tank **48** until the desired amount of heated water is introduced

into brew tank **48**. The water in brew tank **48** may reach water level **72**. In this configuration, hold plate **68** is disposed below water level **72** and acts to hold tea bags **58** below water level **72**. The heated water in contact with tea bags **58** in brew tank **48** forms liquid tea concentrate.

[24] Referring to Figure 4, after the brewing process is completed as described hereinbelow, tea bags **58** may be squeezed to remove additional tea. When it is desired to squeeze tea bags **58**, brew tank lid **54** is detached from squeeze plate **64** by removing pins **66**. Pins **66** may be used to attach squeeze plate **64** to brew tank **48**. However, pins **66** may not be needed if the weight of squeeze plate **64** is sufficient to hold it on brew tank **48**. Hoist **60** then raises brew tank lid **54**, which causes lifting base **52** to move vertically relative to squeeze plate **64** until tea bags **58** contact hold plate **68** thereby squeezing tea from tea bags **58**.

[25] Referring again to Figure 1, liquid tea concentrate is pumped from brew tank **48** into conduit **80** by brew pump **78**, which may be a ten (10) horsepower centrifugal pump. Brew pump **78** may be activated when the liquid in brew tank **48** reaches a predetermined level. From conduit **80**, liquid tea may be conducted through a first filter **82** and through a second filter **84** to remove tea leaf particles. First filter **82** may be a five (5) micron filter and second filter **84** may be a one (1) micron filter, such as those available from Millipore Corporation.

[26] From second filter **84**, the liquid tea concentrate is conducted through conduit **86** and into blend tank **12**. Blend pump **18** pumps the liquid tea concentrate through

first heat exchanger **26**, through conduit **44** and into brew tank **48**. Circulation of the liquid tea concentrate through the blend tank **12** and brew tank **48** continues for about 60 to 70 minutes, and preferably for approximately sixty (60) minutes, while first heat exchanger **26** maintains the temperature of the liquid tea concentrate between approximately 180°F and 200°F, and preferably about 198°F.

[27] At the end of the brew cycle all the liquid tea concentrate is pumped into blend tank **12**. At this time tea bags **58** in brew tank **48** may be squeezed in a manner as described above to remove additional liquid tea concentrate therefrom. This additional liquid tea concentrate is then pumped to blend tank **12** by brew pump **78**.

[28] Still referring to Figure 1, an additive source **90** may be connected by valving to conduit **16** to add selected flavors, tea essence, coloring and/or acids, such as phosphoric acid, to the liquid tea concentrate in brew tank **12** by means of blend pump **18**.

[29] After additives have been introduced, a liquid sweetener, such as sugar, from sweetener source **92** may be added. The use of a sweetener is optional and may not be used for unsweetened tea. Sweetener source **92** is connected by conduit **94** to second mass flow meter **96**, which may be a Micromotion mass flow meter. Conduit **98** conducts sweetener from second mass flow meter **96** through second heat exchanger **100** and through a check valve **102** into conduit **24** for mixing with the liquid tea concentrate in conduit **24**. Check valve **102** may be a Tricolver check valve and prevents back flow in conduit **98**. Second heat exchanger **100** may be a steam heat

exchanger and connected to steam source **28** for heating the sweetener to between about 95°F and 110°F, and preferably to about 100°F. Approximately 2,300 gallons of sweetener is added per 2,100 gallons of liquid tea concentrate. Liquid sweetener is added at a rate of about 60 gallons per minute.

[30] As liquid tea concentrate is pumped by blend pump **18** from blend tank **12** through conduit **24** liquid sweetener is introduced into conduit **24** and mixed with the liquid tea concentrate. Valve **103** is then activated and the mixture of liquid tea concentrate and liquid sweetener are pumped by blend pump **18** through conduit **104** while sweetener is introduced and into transfer tank **108**, which may be a 5,000 gallon tank.

[31] From transfer tank **108**, the blended tea concentrate is pumped by transfer pump **110** through conduit **112** and through a conventional cooling system **116** chosen from those well known in the art, where the blended tea concentrate is cooled to between about 40°F and 50°F, and preferably to about 45°F. From cooling system **116**, the blended tea concentrate is pumped through conduit **18** and into one of three (3) storage tanks **124** located in cold storage room **128** and stored at between approximately 40-45°F. Once the blended tea concentrate is pumped into storage tanks **124**, the brewing system and blending system may be purged with nitrogen to clean the system and remove oxygen. Throughout the process, the liquid tea concentrate and liquid tea are not exposed to outside air.

[32] Next, the blended tea concentrate is pumped by pump **130**, which may be a three (3) horsepower Thompson centrifugal pump, through conduit **132** and into mixing tanks **134**.

Water from water source **136**, which may be purified water, is then introduced into conduits **140** and into mixing tanks **134**. Water is mixed with the blended tea concentrate in proportions of about six (6) gallons of water for each gallon of blended tea concentrate to produce the liquid tea product. In addition, vitamins, diet sweetener, flavorings or other additives may be added. The product is then transferred to bottler system **144** where the product is placed in plastic bottles. The plastic bottles are then moved to the pasteurization system **146** where the product is pasteurized in the bottles using a pasteurization method well known in the art. From pasteurization system **146**, the bottles are moved through conveyor cooling system **148** to cool the product to room temperature. Thereafter, the product may be distributed for sale.

[33] Although the invention has been described in detail for the purpose of illustration based on what is currently considered to be the most practical and preferred embodiments, it is to be understood that such detail is solely for that purpose and that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover modifications and equivalent arrangements that are within the spirit and scope of the appended claims.